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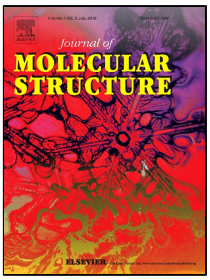

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ACCEPTED MANUSCRIPT

The Effect of Thickness on the Optical, Structural and Electrical Properties of ZnO Thin Film Deposited on n-type Si

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ABSTRACT

In this study, we investigated the effect of thickness on the optical, structural and electrical properties of ZnO thin film deposited on n-type Si wafer. Three groups of transparent conductive ZnO layers were successively deposited by Radio Frequency (RF) magnetron sputtering. Structural properties of ZnO thin film layers were examined by using X-ray diffraction (XRD). Particle sizes of ZnO samples were investigated by the Atomic Force Microscope (AFM) measurements, and the results compared with XRD measurements. The optical characteristics of thin films were obtained via using UV-Vis spectrometer. It was tried to determine the effect of film thickness on electrical and optical properties. Moreover, the devices with ZnO interfacial layer were fabricated using the deposited ZnO films having thickness of 5, 50, and 250 nm. The electrical characteristics of the devices were investigated by capacitance/conductance-voltage (C/G-V) measurements. It was seen that both the band gap and capacitance values decrease as the ZnO film thickness increases.

Key words: Zinc oxide, electrical properties, deposition, sputtering technique.

1. Introduction

ZnO, which is a group of 2-5 semiconductor compounds, has good electrical properties at room temperature, transparency in visible region and wide band gap (3.37 eV) [1-5]. Due to the these large potential properties zinc oxide has been widely used as the transparent conductive oxide (TCO) layers in numerous applications such as optoelectronic devices [6], UV Photodetectors [7],

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